Republic of the Philippines
MARINDUQUE STATE COLLEGE
COLLEGE OF INFORMATION AND COMPUTING SCIENCES
Panfilo M. Manguera Sr. Rd., Tanza, Boac, Marinduque
SICS Tel. No.: (042) 704-0193 SICS E-mail Address: sics.msc@gmail.com
Website: www.mscmarinduque.edu.ph

Capstone Project Title Approval Form

Group Code: [SD-3E1]

Proponents

Project Leader: June Charles Mariquit

Group Members:

Daniela Marquez
Jayron David Sadian
Rubylyn Rey

Proposed Capstone Project Title

HydroAlert: Arduino-Powered Water and Rainfall Monitoring Alarm

Name and Contact No. or Target Organization

Homeorners

Platform

Web-based/Firebase Database/Arduino IDE

Background of the Organization/Firm/Target Pilot Area

Homeorners is dedicated to improving the residential experience, particularly in urban and suburban settings. We recognize the common challenges faced by homeowners, including the inconvenience and potential property damage resulting from leaving outdoor belongings exposed to unexpected rainfall. Additionally, there is a notable missed opportunity for water conservation when residents fail to utilize rainwater harvesting methods.

These challenges not only inconvenience individuals but also contribute to water wastage and property damage. Unmonitored rainfall can lead to soaked belongings and unnecessary runoff, exacerbating environmental concerns and increasing utility costs.

In response to these challenges, we are proposing the HydroAlert project. This initiative aims to provide homeowners with a solution for real-time monitoring of rainfall and water levels, enabling them to receive timely alerts and take proactive measures to safeguard their property and conserve water resources.

By addressing these common problems through technological innovation and community engagement, Homeorners seeks to enhance the resilience and sustainability of residential living environments. Through the HydroAlert project, homeowners will be empowered to make informed decisions and contribute to a more environmentally conscious and efficient way of living.

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Problem Statement		
Problems	***Causes***	***Solutions (As a Feature of your System***
Unforeseen Rain Damage	Lack of awareness or timely information about impending rainfall leads to clothes being left outside, resulting in them getting drenched by sudden rain showers.	Implement a rain monitoring alarm system that provides real-time alerts about approaching rain showers. This system can be integrated with weather forecasting technologies to predict rain with high accuracy. Homeowners receive notifications on their smartphones or smart home devices, allowing them to quickly retrieve or protect outdoor belongings like clothes before the rain arrives. Additionally, customizable alerts can be set based on rainfall intensity, ensuring appropriate actions are taken to mitigate damage.
Water Waste	Individuals miss opportunities to conserve water due to the lack of awareness about imminent rainfall, resulting in unused rainwater running off into drains.	Implement a rain monitoring alarm system with rainwater harvesting features. This system alerts homeowners about upcoming rainfall and automatically activates rainwater collection mechanisms, such as rain barrels or cisterns. Integration with smart irrigation systems allows efficient distribution of collected rainwater for gardening and outdoor use, reducing reliance on municipal water sources.

Objectives

The objectives of the "HydroAlert: Arduino-Powered Water and Rainfall Monitoring Alarm" project include the development of a real-time monitoring system for water levels and rainfall. This system will automate alerts to homeowners, fostering proactive decision-making and integrating seamlessly with existing smart home technologies. The goal is to empower users with insights into environmental conditions, optimizing water resource management and contributing to sustainable living. The project will undergo a pilot implementation in a target house, with a focus on user-friendliness and community engagement to refine the system based on real-world feedback. Ultimately, HydroAlert aims to exemplify SmartHome's commitment to intelligent, connected ecosystems in modern living.

Specific Objectives

1. Real-Time Environmental Monitoring:
 - Develop a robust system for real-time monitoring of water levels and rainfall, ensuring accurate and up-to-date data to enhance environmental awareness.

2. Automation and Alert System:
 - Implement automation features that enable the system to send instant alerts to homeowners in response to significant changes in water levels or rainfall, facilitating timely and informed decision-making.

3. User-Friendly Integration with Smart Home Technologies:
 - Design HydroAlert to seamlessly integrate with existing smart home technologies, providing homeowners with an intuitive interface for monitoring and managing the system effortlessly.

4. Optimized Water Resource Management:
 - Empower homeowners with actionable insights into environmental conditions, enabling them to make informed decisions about water usage and contribute to more efficient and sustainable water resource management practices.

5. Pilot Implementation and User Feedback:
 - Conduct a pilot implementation of HydroAlert in a target house within the chosen pilot area, gathering user feedback to refine the system's usability, adaptability, and effectiveness in a real-world smart home environment.

Specific Functions and Features

1. Water Level Monitoring:
   - Utilize sensors to continuously measure and monitor water levels in designated areas, providing real-time data on water conditions.
2. Rainfall Detection:
   - Implement sensors capable of detecting rainfall intensity and duration, allowing the system to gather accurate information on precipitation.
3. Automated Alerts:
   - Develop an alert system that automatically notifies homeowners through mobile applications or other smart home devices in the event of rising water levels or significant rainfall, enabling prompt response.
4. Integration with Smart Home Platforms:
   - Ensure compatibility with popular smart home platforms such as Amazon Alexa, Google Home, or Apple HomeKit for seamless integration and control through voice commands.
5. User-Friendly Dashboard:
   - Design an intuitive and user-friendly dashboard accessible through a web-based platform or mobile application, providing homeowners with clear visualizations of water and rainfall data.
6. Historical Data Logging:
   - Enable the system to log historical data, allowing homeowners to track trends in water levels and rainfall over time for informed decision-making and analysis.
7. Customizable Alert Thresholds:
   - Provide users with the flexibility to set customizable alert thresholds based on their preferences and the specific needs of their environment.
8. Low-Power Consumption:
   - Optimize the system for low-power consumption to ensure prolonged operation without frequent battery replacements, enhancing overall reliability.
9. Community Engagement Features:
   - Incorporate features that encourage community engagement, such as sharing anonymized data for broader environmental awareness and fostering a sense of collective responsibility.

10. Remote Monitoring and Control:
    - Allow homeowners to remotely monitor and control the HydroAlert system, providing access to real-time data and the ability to adjust settings from anywhere with an internet connection.

Significance and Possible Users

Significance:

- Efficient Water Resource Management: Timely insights and alerts facilitate optimized water usage, reducing waste and promoting sustainability.
- Risk Mitigation: Automated alerts help mitigate potential damage by providing early warnings about rising water levels and heavy rainfall.
- Smart Living Integration: HydroAlert seamlessly integrates with popular smart home platforms, enhancing the overall intelligence and convenience of modern residential environments.
- Community Engagement: Features such as community data sharing foster a sense of environmental responsibility and collective awareness.

Possible Users:

- Homeowners and Residents: Individuals seeking to make informed decisions about water conditions around their homes for efficient resource management.
- Smart Home Enthusiasts: Those invested in smart home technologies can seamlessly integrate HydroAlert into existing systems for a more comprehensive living experience.

Level of Feasibility

Technical Feasibility

The proposed HydroAlert system leverages established technologies, including Arduino for sensor development, web platforms for real-time monitoring, Firebase for data management, and Android support using Android Studio. These technologies are well-documented and widely supported, ensuring seamless integration and functionality.

Arduino's adaptability enables the creation of customizable sensors for comprehensive water and rainfall monitoring. Utilizing sensors to measure water levels and detect rainfall intensity, the system can gather accurate and up-to-date data on environmental conditions.

The integration with web platforms and Firebase database management ensures efficient data storage, retrieval, and real-time access for homeowners. This allows for timely alerts and notifications in response to significant changes in water levels or rainfall, facilitating proactive decision-making.

While challenges may arise during the implementation phase, such as sensor calibration or network connectivity issues, these can be mitigated through thorough testing and troubleshooting procedures. Additionally, the open-source nature of Arduino and Firebase allows for community support and continuous improvement, ensuring the long-term viability and scalability of the HydroAlert system.

Overall, the technical setup required for HydroAlert is readily accessible and straightforward to implement, supported by its seamless Arduino-to-Firebase data flow and user-centric design approach.

Operational Feasibilty:

- HydroAlert offers a user-friendly interface accessible via web and mobile platforms, ensuring effortless setup and monitoring for homeowners. Utilizing Arduino technology, the system collects data from rain sensors and transmits it to Firebase database for storage and management. The integration with smart home ecosystems, even for homeowners without existing systems, enhances their experience by providing comprehensive rain monitoring. The instant notification system enables prompt alerts about impending rainfall, improving operational efficiency in water resource management. By addressing the fundamental aspects of feasibility, HydroAlert emerges as a practical solution for enhancing rain monitoring and water conservation efforts, supported by its seamless Arduino-to-Firebase data flow and user-centric approach.

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For Review Committee Only

Comments:

Status:	_____
☐ For Revision ☐ Approved ☐ Disapproved	Signature Over Printed Name

Note: You may attach the results of your survey and feasibility analysis, if needed.